EXHIBIT 14

Part 1 of 2

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Cisco Systems, Inc.
Petitioner

v.

Capella Photonics, Inc.
Patent Owner

Patent No. RE42,368
Filing Date: June 15, 2010
Reissue Date: May 17, 2011

Title: RECONFIGURABLE OPTICAL ADD-DROP MULTIPLEXERS WITH SERVO CONTROL AND DYNAMIC SPECTRAL POWER MANAGEMENT CAPABILITIES

Inter Partes Review No. 2014-01166

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Exhibit 1019: Giles et al., Reconfigurable 16-Channel WDM DROP Module Using Silicon MEMS Optical Switches, IEEE Photonics Technology Letters, Vol. 11, No. 1, (Jan. 1999) ("Giles 16-Channel WDM DROP Module")

Exhibit 1020: Andrew S. Dewa, and John W. Orcutt, *Development of a silicon 2-axis micro-mirror for optical cross-connect*, Technical Digest of the Solid State Sensor and Actuator Workshop, Hilton Head Island, SC, June 4-8, 2000) at pp. 93-96 ("Dewa")

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Exhibit 1031: U.S. Patent No. 5,414,540 to Patel et al. ("Patel")

Exhibit 1032: Borella, et al., Optical Components for WDM Lightwave Networks, Proceedings of the IEEE, Vol. 85, NO. 8, August 1997 ("Borella")

Exhibit 1033: U.S. Patent No. 6,928,244 to Goldstein et al. ("Goldstein '244")

Exhibit 1034: Steffen Kurth et al., Silicon mirrors and Micromirror Arrays for Spatial Laser Beam Modulation, Sensors and Actuators, A 66, July 1998

Exhibit 1035: C. Randy Giles and Magaly Spector, *The Wavelength Add/Drop Multiplexer for Lightwave Communication Networks*, Bell Labs Technical Journal, (Jan.-Mar. 1999) ("Giles and Spector")

Exhibit 1036: U.S. Patent No. 5,872,880 to Maynard (the "Maynard patent")

Exhibit 1037: R.E. Wagner and W.J. Tomlinson, *Coupling Efficiency of Optics in Single-Mode Fiber Components*, Applied Optics, Vol. 21, No. 15, pp. 2671-2688 (August 1982)

Exhibit 1038: Excerpts from Born et al., PRINCIPLES OF OPTICS, (6th Ed., Pergammon Press 1984)

I. INTRODUCTION

Petitioner Cisco Systems, Inc. requests *inter partes* review under 35 U.S.C. §§ 311-319 and 37 C.F.R. § 42, of claims 1-6, 9-13, and 15-22 (the "Petitioned Claims") of U.S. Patent No. RE42,368 (Ex. 1001) ("the '368 patent"), assigned on its face to Capella Photonics, Inc.

In prosecuting its reissue patent, Patentee admitted that its original claim set was overbroad and invalid in light of U.S. Patent No. 6,498,872 (Ex. 1003) ("Bouevitch"). To fix this claim drafting mistake and to distinguish over Ex. 1003, Patentee made two amendments to all of its independent claims. But those amendments merely swapped one known component for another known component. As described in the body of this petition, those amendments swapped one known type of mirror for another known type of mirror.

While the Patentee's reissue amendments may have addressed the novelty issues in light of Ex. 1003, those amendments do not overcome obviousness. Bouevitch in combination with the prior art described in the body of this petition renders the Petitioned Claims invalid as obvious.

II. MANDATORY NOTICES UNDER 37 C.F.R. § 42.8(A)(1)

A. Real Party-In-Interest under 37 C.F.R. § 42.8(b)(1)

Petitioner Cisco Systems, Inc. is the real party-in-interest for this petition.

B. Related Matters under 37 C.F.R. § 42.8(b)(2)

The '368 Patent is asserted against Cisco in an on-going patent lawsuit brought by Patent Owner in *Capella Photonics, Inc. v. Cisco Systems, Inc.*, Civil Action Nos. 1-14-cv-20529 ("Capella litigation"), filed in the Southern District of Florida on February 14, 2014. Claims 1-6, 9-13 and 15-22 of the '368 patent are asserted in the Capella litigation.

C. Lead and Back-Up Counsel under 37 C.F.R. § 42.8(b)(3)

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D. Service Information

As identified in the attached Certificate of Service, a copy of the present petition, in its entirety, including all Exhibits and a power of attorney, is being served by USPS EXPRESS MAIL, costs prepaid, to the address of the attorney or agent of record for the '368 patent: Barry Young, Law Offices of Barry N. Young, P.O. Box 61197, Palo Alto, CA 94306. Petitioner may be served at the lead counsel address provided in Section I.C. of this Petition. Petitioner consents to service by e-mail at the e-mail addresses provided above.

E. Power of Attorney

A power of attorney is being filed concurrently with this petition in

accordance with 37 C.F.R, § 42.10(b).

III. PAYMENT OF FEES - 37 C.F.R. § 42.103

This petition for *inter partes* review requests review of 19 claims of the '368 patent and is accompanied by a request fee payment of $24,600. *See* 37 C.F.R. § 42.15. Thus, this petition meets the fee requirements under 35 U.S.C. § 312(a)(1).

IV. REQUIREMENTS FOR *INTER PARTES* REVIEW UNDER 37 C.F.R. § 42.104

A. Grounds for Standing under 37 C.F.R. § 42.104(a)

Petitioner certifies that the '368 patent is eligible for *inter partes* review and further certifies that Petitioner is not barred or otherwise estopped from requesting *inter partes* review challenging the identified claims on the grounds identified within the present petition.

B. Identification of Challenge under 37 C.F.R. § 42.104(b) and Statement of Precise Relief Requested

Petitioner requests *inter partes* review of claims 1-6, 9-13, and 15-22 of the '368 patent under the statutory grounds set forth in the table below. Petitioner asks that each of the claims be found unpatentable. An explanation of how the Petitioned Claims are unpatentable is included in Part VIII of this petition. Additional explanation and support for each ground of rejection is set forth in the Declaration of a technical expert, Dr. Dan Marom (Ex. 1028) ("Marom Decl.,").

Ground	'368 Patent Claims	Basis for Challenge

Ground	'368 Patent Claims	Basis for Challenge
1	1-6, 9-13, and 15-22	Obvious under § 103(a) by Bouevitch in view of Smith.
2	1-6, 9-13, and 15-22	Obvious under § 103(a) by Bouevitch in view of Smith further in view of Lin.
3	12	Obvious under § 103(a) by Bouevitch in view of Smith in further view of Dueck.
4	12	Obvious under § 103(a) by Bouevitch in view of Smith and Lin in further view of Dueck.

Each of the references relied upon in the grounds set forth above qualify as prior art under 35 U.S.C., § 102(e) or (b).

This Petition and the Declaration of Dan Marom, submitted herewith, cite additional prior art materials to provide background of the relevant technology and to explain why one of skill in the art would combine the cited references.

C. Threshold Requirement for *Inter Partes* Review 37 C.F.R. § 42.108(c)

Inter partes review of claims 1-6, 9-13, and 15-22 should be instituted because this Petition establishes a reasonable likelihood that Petitioner will prevail with respect to at least one of the claims challenged. *See* 35 U.S.C. § 314(a). Each limitation of each challenged claim is disclosed by and/or obvious in light of the prior art.

V. BACKGROUND OF TECHNOLOGY RELATED TO THE '368 PATENT

Fiber-optic communication uses light to carry information over optical fibers. Originally, fiber-optic systems used one data channel per fiber. To increase the number of channels carried by a single fiber, wavelength division multiplexing ("WDM") was developed. WDM is a type of optical communication that uses different wavelengths of light to carry different channels of data. WDM combines (multiplexes) multiple individual channels onto a single fiber of an optical network. WDM was known before the '368's priority date. (E.g., Ex. 1015 at 904.)

At different points in a fiber network, some of the individual channels may be extracted (dropped) from the fiber, for example when those channels are directed locally and need not be passed further down the fiber network. And at these network points, other channels may also be added into the fiber for transmission onward to other portions of the network. To handle this add/drop process, optical add-drop multiplexers (OADMs) were developed. OADMs are used to insert channels onto, pass along, and drop channels from an optical fiber without disrupting the overall traffic flow on the fiber. (Ex. 1001 at 1:51-58.) OADMs were known long before the '368 priority date. (E.g., Ex. 1015 at 904.)

(Re)configurable OADMs are referred to as "ROADMs" or "COADMs," which are controllable to dynamically select which wavelengths to add, drop, or

pass through. (Ex. 1003 at Abstract; Ex. 1019 at 64.) These types of devices were known in the art prior to the '368 priority date. (Marom Decl., Ex. 1028 at ¶ 29.)

ROADMs operate by separating the input light beam into individual beams—each beam corresponding to an individual channel. Each input channel/beam is individually routed by a beam-steering system to a chosen output port of the ROADM. For example, a first channel can be steered so that it is switched from an "input" port to an "output" port. Channels switched to the "output" port are passed along the network. At the same time, a second channel can be switched to a "drop" port and removed from the main fiber. The ROADM could also add a new channel to the main fiber through the "add" port to replace the dropped channel. These add/drop techniques were known prior to the '368 priority date. (Ex. 1028 at ¶ 29; Ex. 1003 at 5:15-38; Ex. 1016 at 1:55-2:45; Ex. 1017 at 1:56-67.)

In addition to routing channels, ROADMS may also be used to control the power of the individual channels. Power control is often performed by steering individual beams slightly away from the target port such that the misalignment reduces the amount of the channel's power that enters the port. This misalignment power control technique in ROADMs was known prior to the '368 priority date. (*See e.g.*, Ex. 1028 ¶ 35, ¶ 60; Ex. 1006 at 2:9-21.)

ROADMs use wavelength selective routers (WSRs) to perform switching

and power control. (*See, e.g.*, Ex. 1026 at 10:64-11:29.) WSRs are also referred to as wavelength selective switches (WSSs). (*See*, *e.g.*, Ex. 1027 at Fig. 1.) As of the '368 priority date, WSRs/WSSs were known. (*See, e.g.*, Ex. 1026 at Abstract, 4:15-25; Ex. 1027 at Fig. 1; Ex. 1032 at 1292, 1300.)

The embodiment of WSRs relevant to this petition steers light beams using small tilting mirrors, sometimes called MEMS, which stand for Micro ElectroMechanical Systems. (Ex. 1028 ¶ 36, 31.) Prior-art WSRs could tilt the individual mirrors using analog voltage control. (*Id.*) The tilt allows reflected beams to be aimed at selected ports. Prior-art MEMS mirrors could be tilted in one or two axes. (*Id.* at 37.)

VI. SUMMARY OF THE '368 PATENT

The '368 patent originally issued as U.S. Patent No. 6,879,750. According to the Patentee, the original patent's claims were invalid over Bouevitch. The Patentee expressly acknowledged its claiming mistake and identified the two elements that it alleged needed to be added to its claims to support patentability– (1) mirror control in two-dimensions, and (2) the mirror's use for power control:

> ***At least one error upon which reissue is based is* described as follows: *Claim 1 is deemed to be too broad and invalid in view of U.S. Patent No. 6,498,872 to Bouevitch*** and further in view of one or more of Ex. 1023 U.S. Patent No. 6,567,574 to Ma, Ex. 1024 U.S. Patent No. 6,256,430 to Jin, or Ex. 1025 U.S. Patent No. 6,631,222 to Wagener ***by***

failing to include limitations regarding the spatial array of beam deflecting elements being individually and continuously controllable in two dimensions to control the power of the spectral channels reflected to selected output ports, as indicated by the amendments to Claim 1 in the Preliminary Amendment. (Ex. 1002 at 81-82.)

In its efforts to distinguish over Bouevitch, Patentee's first amendment specified that the beam-deflecting elements must be controllable in two dimensions. This amendment corresponds to a mirror tilting in two axes rather than one. As for the second amendment, Patent Owner added a use clause stating that the beam-deflecting elements could be used to control power. As explained in the claim construction section (§ VII, below), use clauses are not limiting, and have no impact on an invalidity analysis. Claim 1 of the '750 patent as amended, with the amendments underlined, is shown in Table 1.

Table 1	
1	An optical add-drop apparatus comprising
1a	an input port for an input multi-wavelength optical signal having first spectral channels;
1b	one or more other ports for second spectral channels; an output port for an output multi-wavelength optical signal;
1c	a wavelength-selective device for spatially separating said spectral channels;
1d	a spatial array of beam-deflecting elements positioned such that each element receives a corresponding one of said spectral channels, each of said elements being individually and continuously controllable <u>in two dimensions</u> to reflect

	its corresponding spectral channel to a selected one of said ports <u>and to control the power of the spectral channel reflected to said selected port</u>.

The Patentee made almost identical amendments to the 3 other independent claims.

Through the Patentee's admissions about Bouevitch, the Patentee also admitted that Bouevitch disclosed all the elements of at least claim 1, except for 2-axis mirrors. The Patentee first admitted that Bouevitch anticipated the pre-reissue version of claim 1 as it appeared in the '750 patent. Following that, the only amendments the Patentee added to the claim were 2-axis mirrors and their intended use for power control. Because the intended use language is not limiting, as discussed in the next section, the Patentee admitted that Bouevitch disclosed all limitations but for 2-axis mirrors. (*See* MPEP § 2217 ("admissions by the patent owner in the record as to matters affecting patentability may be utilized during a reexamination") (citing 37 CFR 1.104(c)(3)).)

VII. CLAIM CONSTRUCTION UNDER 37 C.F.R. § 42.104(B)(3)

A. Legal Overview

A claim subject to *inter partes* review ("IPR") is given its "broadest reasonable construction in light of the specification of the patent in which it appears." 37 C.F.R. § 42.100(b). Except as expressly set out below, Petitioner construes the language of the claims to have their plain and ordinary meaning.

B. [Controllable] "in two dimensions"

The broadest reasonable interpretation ("BRI") for the term "in two dimensions" in light of the specification is "in two axes." As the claim states, the "beam-deflecting elements" are "controllable in two dimensions." The '368 consistently describes these beam-deflecting elements as various types of mirrors which are rotated around the two axes in which the mirrors tilt to deflect light. The specification states, for example, that the beam-deflecting elements "may be pivoted about one or two axes." (Ex. 1001 at 4:25-26, Abstract.) The specification also describes certain embodiments that use two-dimensional arrays of input and output ports. For these embodiments, the specification describes that the mirrors are required to tilt along two axes ("biaxially") to switch the beams between the ports. (*Id.*, 4:25-29.) And further, the '368 patent explains how to control power by tilting the mirrors in two axes. (*Id.*, 16:36-51 (describing the combined use of major and minor "tilt axes" for power control & switching).)

C. "To control the power of the spectral channel..." and "to reflect its corresponding spectral channel to a selected one of said ports" (Claims 1-16); "whereby a subset of said spectral channels is directed to said drop ports" (Claim 15); and "for monitoring power levels" and "for controlling said beam-deflecting elements" (Claim 3)

Each of the above terms is a mere statement of intended use and is not limiting under a BRI for apparatus claims 1-16. The Federal Circuit stated that "apparatus claims cover what a device *is*, not what a device *does*." *Hewlett–*

Packard Co. v. Bausch & Lomb Inc., 909 F.2d 1464, 1468 (Fed. Cir. 1990). "An intended use or purpose usually will not limit the scope of the claim because such statements usually do no more than define a context in which the invention operates." *Boehringer Ingelheim Vetmedica, Inc. v. Schering-Plough Corp.*, 320 F.3d 1339, 1345 (Fed. Cir. 2003); *see also Paragon Solutions, LLC v. Timex Corp.*, 566 F.3d 1075 (Fed. Cir. 2009); MPEP §§ 2114, 1414.)

The BPAI has also had the opportunity to address use clauses. In *Ex parte Kearney,* the BPAI stated that use clauses need not be considered when evaluating the validity of a claim. *Ex parte Kearney*, 2012 Pat. App. LEXIS 2675, at *6 (BPAI 2012) ("our reviewing court has held that the absence of a disclosure relating to function does not defeat a finding of anticipation if all the claimed structural limitations are found in the reference.")

The above phrases are non-functional use clauses because they say nothing about the structure of the apparatus. Unlike claim limitations reciting "***configurable to*** [perform a function]," which in some cases inform about the configuration of a part of the apparatus, the term at issue in the '368 patent says nothing about what the apparatus is. Instead, the claus speaks only to what it might do. Petitioner asks that the Board find the above phrases non-limiting.

D. "So as to combine selected ones of said spectral channels into an output" and "so as...to control the power" (claims 17-22)

The above phrases are not limiting for method claims 17-22 under the BRI because each expresses nothing more than the intended result of a method step. A "whereby clause in a method claim is not given weight when it simply expresses the intended result of a process step positively recited." *Minton v. Nat'l Ass'n of Sec. Dealers, Inc.*, 336 F.3d 1373, 1381, 67 USPQ2d 1614, 1620 (Fed. Cir. 2003); MPEP 2111.04 (listing "whereby" as one of several terms that raise questions as to any limiting effect).

Here, instead of a "whereby" or a "whereas" clause, the Patentee chose to use the term "so as," which just as clearly designates an intended result as "whereas." *See Regents of University of California v. Micro Therapeutics, Inc.*, Case No. C03–05669, 2007 WL 734998, *18 (N.D. Cal. Mar. 2, 2007) ("Thus, a 'so that clause' is equivalent to a 'whereby clause' in a method claim. A 'whereby clause' in a method claim that merely states the results of the limitations in the claim adds nothing to the substance of the claim"). Petitioner asks that the Board find the above terms non-limiting.

E. "Continuously controllable"

The BRI for "continuously controllable" in light of the specification is "under analog control." This definition is consistent with the use of the term in the specification, which describes how "analog" means are used to effect continuous control of the mirrors. The patent explains that "[a] distinct feature of the channel

micromirrors in the present invention, in contrast to those used in the prior art, is that the motion…of each channel micromirror is under ***analog control*** such that its pivoting angle can be ***continuously adjusted***." (*Id.*, 4:7-11; emphasis added). Another passage in the specification states that "[w]hat is important is that the pivoting (or rotational) motion of each channel micromirror be individually ***controllable in an analog manner, whereby the pivoting angle can be continuously adjusted*** so as to enable the channel micromirror to scan a spectral channel across all possible output ports." (*Id.*, 9:9-14; emphasis added). Yet another passage states that "channel micromirrors 103 are individually controllable and movable, e.g., pivotable (or rotatable) under analog (or continuous) control." (*Id.*, 7:6-8).

F. "Servo-control assembly" (Claims 3 & 4)

The BRI for the term "servo control assembly" in light of the specification is "feedback-based control assembly" This definition is consistent with the use of the term in the specification, which equates servo control with use of a feedback loop. For example, when describing its "servo control," the '368 patent teaches a spectral monitor that provides "feedback" control for the mirrors. "The servo-control assembly 440 further includes a processing unit 470, in communication with the spectral monitor 460 and the channel micromirrors 430 of the WSR apparatus 410. The processing unit 470 uses the power measurements from the

spectral monitor 460 ***to provide feedback control*** of the channel micromirrors 430." (*Id.*, 11:18-24 emphasis added.) In another passage, the '368 patent states that the servo-control assembly "serves to monitor the power levels of the spectral channels coupled into the output ports and further provide control of the channel micro mirrors on an individual basis, so as to maintain a predetermined coupling efficiency of each spectral channel." (*Id.*, 4:45-52.)

Moreover, in the figure that the `368 patent labels "servo-control assembly," the '368 patent shows a controller which takes measurements of the output power and moves the mirrors to further adjust that power—a typical feedback loop. (*Id.*, Fig. 4a; Ex. 1014.) Also confirming this BRI, the feedback-based control described in the '368 patent achieves the same goals that the patent ascribes to its "servo-control assembly"—dynamic adjustment to account for changing conditions, such as the possible changes in alignment of the parts within the device. (Ex. 1001 at 4:56-67.)

Petitioner is aware that a "servo" can sometimes refer to a servomotor, which is a type of actuator. But that is not what the patent is referring to here with its use of servo in the context of a "servo-control assembly." Should Capella attempt to change the "servo-control assembly" to refer instead to some "servo"-based *actuation* mechanism (as opposed to a ***control*** mechanism), there is no support for that in the specification. The '368 patent nowhere address the details

of the MEMS mirror actuation, and instead discusses "servo-control" and "servo-based" strictly in terms of the ***control*** system used to move the mirrors, not the actuation mechanism that physically moves them. (*See*, *e.g.*, Ex. 1001 at 4:45-, 5:5, 6:3-16, 10:62-12:49.)

G. "Spectral monitor"(claim 3)

The BRI for the term "spectral monitor" is "a device for measuring power." This definition is consistent with the use of the term in the specification, where the monitor is used to measure the power of the output signals. The spectral monitor is shown in Figure 4A measuring output power, and the specification describes the spectral monitor as providing power measurements as part of a feedback loop. (*Id.*, 11:14-23 ("processing unit 470 uses the power measurements from the spectral monitor 460 to provide feedback control").) In addition, the only requirement for the spectral monitor that the patent identifies is that the monitor "be capable of detecting the power levels of spectral components in a multi-wavelength optical signal." (*Id.*, 11:58-61.)

H. "Beam-focuser" (claim 11)

The BRI for the term "beam-focuser" in light of the specification is "a device that directs a beam of light to a spot." This definition is consistent with the use of the term in the specification and the claims. The Summary of the '368 patent states that the "beam-focuser focuses the spectral channels into

corresponding spectral spots." (*Id.*, 3:63-64.) The specification also explains that the beams of light are "focused by the focusing lens 102 into a spatial array of distinct spectral spots (not shown in FIG. 1A) in a one-to-one correspondence." (*Id.*, 6:65-7:5.) The MEMS mirrors are in turn "positioned in accordance with the spatial array formed by the spectral spots, such that each channel micromirror receives one of the spectral channels." (*Id.*) Claim 11 echoes this, saying that the beam focuser is "for focusing said separated spectral channels onto said beam deflecting elements."

Capella may attempt to narrow "beam-focuser" to a particular one of the embodiments in the '368 patent. For example, one embodiment of a "beam focuser" in the patent corresponds to element 103 in Fig. 3, which depicts a lens focusing light onto a MEMS mirror array. However, the specification also notes that the "focuser" has a broader meaning than simply a lens, and instead, "[t]he beam-focuser may be a single lens, an assembly of lenses, or other beam-focusing means known in the art." (*Id.*, 4:20-22.) Thus, the BRI of "beam-focuser" covers any device capable of directing a beam of light to a spot.

VIII. CLAIMS 1-6, 9-13, AND 15-22 OF THE '368 PATENT ARE UNPATENTABLE

The Petitioned Claims are obvious over Bouevitch in view of Smith (for Ground 1), and also further in view of Lin (for Ground 2). Claim 12 is also obvious under Grounds 1 or 2 in further view of Dueck (Grounds 3 & 4).

Petitioner provides below (1) an overview of the status of Bouevitch, Smith, Lin and Dueck as prior art, (2) a general description of Bouevitch and Smith, (3) motivations to combine these references; and (4) a description of how these references disclose each Petitioned Claim on an element-by-element basis.

A. Smith, Lin and Dueck are all prior art to the '368 patent

Bouevitch and Smith both qualify as prior art under 35 U.S.C. § 102(e) (pre-AIA), because each reference is a patent that issued from an application filed in the United States prior to the earliest application to which the '368 patent could claim priority. The earliest facial priority date for the '368 patent is based on a provisional application filed on March 19, 2001.

Bouevitch is entitled to a 102(e) prior art date of at least its filing date of December 5, 2000. This date is before the earliest '368 priority date.

Smith is entitled to a 102(e) prior art date of September 22, 2000, the filing date of its earliest provisional application. *See, e.g., In re Giacomini*, 612 F.3d 1380 (Fed. Cir. 2010) (holding that a 102(e) reference is prior art as of the filing date of its provisional application, if that provisional provides proper written description support for the claimed invention). The portions of the Smith Patent that Petitioner relies on for its invalidity arguments are fully supported by the Smith Provisional. (Marom Decl., at ¶¶ 130-132.) To demonstrate proper written description as required by *In re Giacomini*, the analysis below includes citations to

both the Smith Patent and the Smith Provisional. Accordingly, Smith predates the earliest '368 priority date.

Dueck is entitled to the 102(b) prior art date of its filing: Dec. 13, 1997. Dueck describes various diffraction gratings for use in WDM devices.

Lin is entitled to the 102(b) prior art date of its filing: Sept. 29, 1995. Lin describes a MEMS optical switch including continuous, analog, control of mirrors.

B. Overview of the Bouevitch Prior Art

Bouevitch explicitly discloses every element of the 4 independent claims of the '368 patent (and most dependent claims) except for the use of mirrors rotatable in two axes. Bouevitch discloses mirrors that are rotatable in a single axis.

Bouevitch discloses a configurable optical add/drop multiplexer (COADM) that uses MEMS mirrors for routing signals and controlling power. (*Id.*, Abstract) By tilting its MEMS mirrors, the Bouevitch COADM switches an input spectral channel to either an output port or a drop port. (*Id.*, 14:14-15:18, Fig. 11.) The Bouevitch COADM can also add a new channel in place of a dropped channel. (*Id.*)

The Bouevitch COADM controls the power of its output channels by tilting beam-deflecting elements (mirrors) at varying angles to control power. The "degree of [power] attenuation is based on the degree of deflection provided by the reflector (i.e., the angle of reflection)." (*Id.*, 7:23-37.) Bouevitch refers to this

power control process as Dynamic Gain Equalizer (DGE) and discloses that the DGE is used "to control the relative power levels in respective channels" of a WDM system. (*Id.*, 1:24-25.)

Bouevitch's COADM uses MEMS mirrors with 1 axis of rotation. (*E.g.*, Ex. 1003 at 7:23-37 (describing attenuation by tilting mirrors along one axis).)

C. Overview of the Smith Prior Art

Like Bouevitch, Smith is directed at MEMS-based COADMs for optical communications. Smith discloses a COADM that uses MEMS mirrors rotatable in one and two axes for switching and power control in WDM optical communications. (Ex. 1004 at Abstract.) The Smith Provisional similarly describes "a mirror array with elements that can be rotated in an analog fashion about two orthogonal axes," with one axis for switching, and one axis for power control. (*Id.*, p. 6.) The Smith Patent notes that the 1-axis and 2-axis mirrors are interchangeable. (*Id.*, 17:58-67, 16:55-58.) Thus, to the extent Bouevitch does not disclose 2-axis mirrors and their intended use for power control, both the Smith Patent and the Smith Provisional each does so.

D. PHOSITA had ample motivation to combine Bouevitch with Smith, including the motivations disclosed in both references

A person having ordinary skill in the art ("PHOSITA") at the time of the '368 patent would have been an engineer or physicist with at least a Master's degree, or equivalent experience, in optics, physics, electrical engineering, or a

related field, including at least three years of additional experience designing, constructing, and/or testing optical systems. (Ex. 1028 at ¶ 20.) To the PHOSITA, Bouevitch and Smith were combinable for purposes of establishing obviousness under 35 U.S.C. § 103(a). (*Id.*, ¶ 28-47.) Most of the *KSR* obviousness rationales support combining these two references. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 415-421 (2007); MPEP § 2141.

First, the use of Smith's 2-axis mirrors in Bouevitch's system is a simple substitution of one known, closely-related element for another that obtains predictable results. The 1-axis mirrors of Bouevitch and the 2-axis mirrors of Smith were known to be interchangeable. (Ex. 1028 at ¶¶ 39-41.) Smith expressly acknowledges this interchangeability: "in comparison to the two-axis embodiment, single axis systems may be realized using simpler, single axis MEMS arrays but suffer from increased potential for crosstalk between channels." (Ex. 1005 at 11; Ex. 1004 at 18:17-18.) Smith also states that "both single and dual axis mirror arrays may be used in a variety of switching configurations, although the two-axis components are preferred." (Ex. 1005 at 11; Ex. 1004 at 16:55-58; Ex. 1007 at 4:17-19 (claiming a crossconnect with "an array of tiltable mirrors comprising a plurality of mirrors, each mirror being tiltable ***about at least one*** tilting axis") (emphasis added).)

Second, combining Bouevitch with Smith is nothing more than the use of

known techniques to improve similar devices. PHOSITA could use the 2-axis mirrors of the Smith ROADM as a replacement for the 1-axis mirrors in the similar Bouevitch ROADM. (Ex. 1028 at ¶¶ 42-44.) Each reference discusses devices in the same field of fiber optic communications (Ex. 1003 at 1:18; Ex. 1004 at 1:10-15; Ex. 1005 at 1). Each reference is directed at the same application in that field—optical switching for multi-wavelength WDM communications. (Ex. 1003 at Abstract; Ex. 1004 at Title.) Each reference discloses the same type of optical switch—a COADM. And each COADM uses the same type of WSS for switching—a MEMS-based optical add/drop multiplexer. As a result, using the known 2-axis mirrors in the Bouevitch ROADM is nothing more than the use of known techniques to improve similar devices. (Ex. 1028 at ¶¶ 42-44.) And using 2-axis mirrors for power control instead of 1-axis mirrors would yield the same predictable result for power control if used in the MEMS-based switch of Bouevitch. (Ex. 1028 at ¶¶ 43-45.) Rotation about either 1 or 2 axes would result in controllable misalignment to alter power. (Ex. 1028 at ¶¶ 43-45.)

Third, it would be obvious to try Smith's 2-axis mirrors in Bouevitch because 2-axis mirrors were among a small number of identified, predictable solutions, and PHOSITA had a high expectation of success with either. (Ex. 1028 at ¶ 45.) There are only two options for tilting MEMS mirrors: 1-axis and 2-axis mirrors. (Ex. 1028 at ¶ 45) Because Smith already disclosed the use of 2-axis

mirrors (which were available by the '368 patent's priority date), PHOSITA would have a high expectation of success to try 2-axis mirror control in Bouevitch, both for switching and power control. (Ex. 1028 at ¶ 45.) And the impact of tilting in 1 or 2 axes for the steering of a light beam is entirely predictable. (*See id.*, '368 patent, 4:25-29 (2-axes allows 2-D steering); Ex. 1028 at ¶ 45.)

Fourth, Smith and Bouevitch, as well as other contemporaneous prior art, provide explicit motivations to combine the references. For example, PHOSITA would be motivated to use the 2-axis mirrors of Smith with the system of Bouevitch to reduce crosstalk in attenuation. (Ex. 1004 at 18:17-18; Ex. 1028 at ¶¶ 46-47.) Crosstalk is reduced by performing beam misalignment in a different axis than the axis used for switching. (*Id.*; Ex. 1004 at 16:55-59, 18:18-25.) The PHOSITA would also be motivated to use the 2-axis mirrors of Smith with the Bouevitch COADM to increase port density. (Ex. 1028 at ¶¶ 47, 69.) Compact, two-dimensional arrays of fiber ports can be utilized when two-axis mirrors allow beams to be steered in two dimensions to those ports. (Ex. 1028 at ¶ 47; Ex. 1003 at 2:9-21; Ex. 1007 at 3:10-11; Ex. 1009 at 2:1-16.)

Finally, the Patentee's admission during prosecution that claim 1 was invalid over Bouevitch "further in view of one or more of" Ma, Jin, and Wagener also confirms that one of skill in the art would have been motivated to combine Bouevitch with Petitioner's other references which are similar to Ma, Jin, and

Wagener. (*See* Ex. 1002 at 81-82.) By admitting that claim 1 was ***invalid*** over Bouevitch "further in view of one or more of" Ma, Jin, and Wagener, the Patentee also admitted the ***combinability*** of such references. This admission is important because Smith and other references that Petitioner combines with Bouevitch here are directed at the identical technology area as Ma Jin, & Wagener—MEMS-based optical switches for WDM. (*See* Ex. 1023 at 1:6-11, Ex. 1024 at 1:11-20, 2:27-39, Ex. 1025 at 3:20-34, 5:32-43.) Thus, the references Petitioner relies on here are also combinable.

E. Bouevitch and Smith Render Obvious All Petitioned Claims

The Petitioner identifies below how Bouevitch in view of Smith discloses each element of the Petitioned Claims, as well as element-specific motivations to combine the two references (and Lin and Dueck). Given the similarity of many of the Petitioned Claims, some of the explanations below refer to earlier discussions of the same or similar claims to avoid repetition. In such cases, the prior referenced discussions are incorporated fully by reference in the later explanations.

1. Claim 1 – Grounds 1 and 2

The section addresses claim 1 first under Petitioner's Ground No. 1 of Bouevitch+Smith, and then under Ground No. 2 of Bouevitch+Smith+Lin.

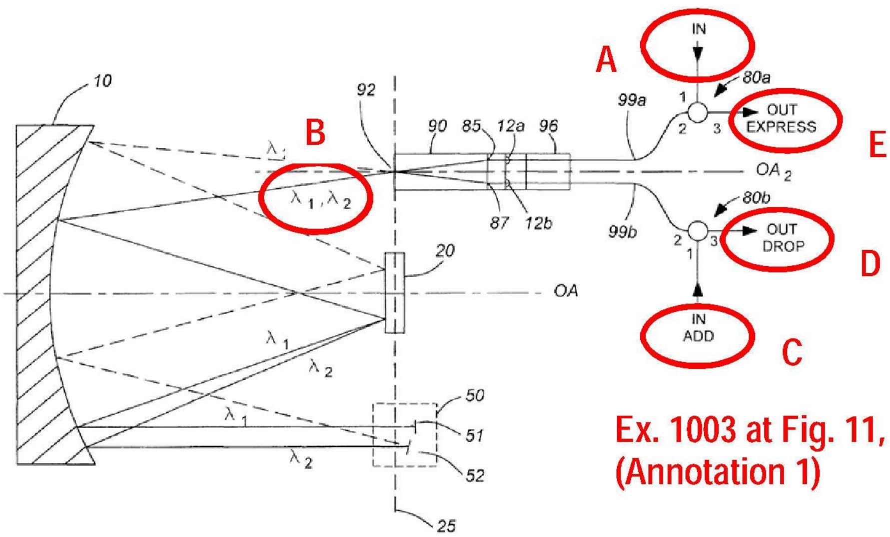
(1) Claim 1 - preamble

The preamble of claim 1 recites "[a]n optical add-drop apparatus

comprising...." Bouevitch discloses a "Configurable Optical Add/Drop Multiplexer (COADM)." (Ex. 1003 at Abstract; *see also Id.*, 5:15–20; 14:14-21; Figs. 1, 11; 3:9-63 (discussing methods of using the COADM).)

(2) Claim element 1[a] - input port

The first limitation of claim 1 recites "an input port for an input multi-wavelength optical signal having first spectral channels." The Patentee admitted in the reissue that Bouevitch discloses this element. (§ VI, above.) The explanation below confirms that the Patentee was correct. Bouevitch discloses an input port "IN," annotated as "A" in Fig. 11-Annotation 1, included below. An optical signal is "launched into" the "IN" port. (*Id.*, 14:38–41.) That signal is a multi-wavelength signal with a first spectral channel λ_1 and a second channel λ_2, as shown at annotation "B" of Fig. 11-Annotation 1 (*Id.*, Fig. 11, 14:39-42, 10:56-61)



Ex. 1003 at Fig. 11, (Annotation 1)

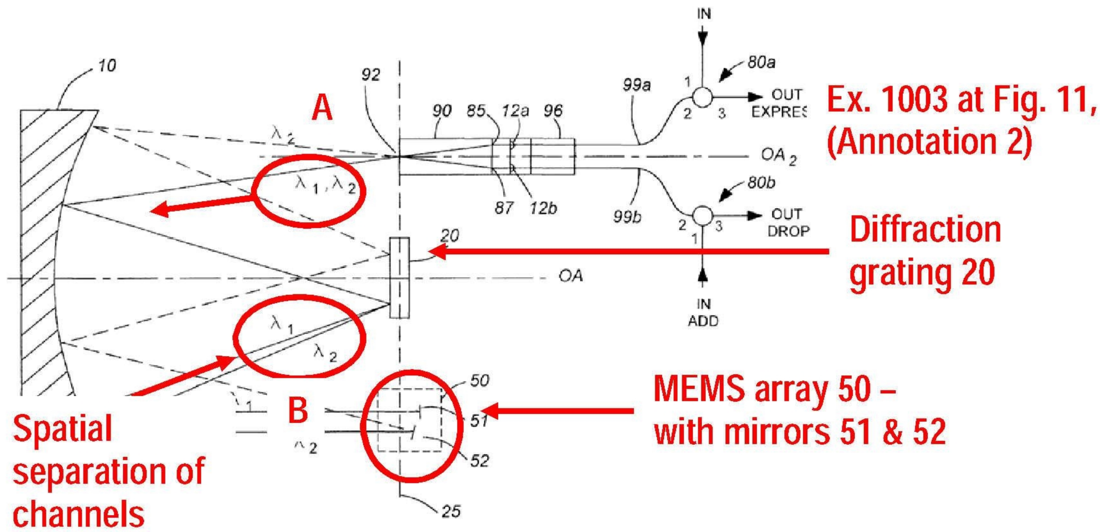
(3) Element 1[b] – Output & other ports for 2nd channels

Other Ports: The first part of limitation 1[b] recites: "one or more other ports for second spectral channels." Bouevitch discloses two ports in addition to the input and output ports. Bouevitch labels one port as 80b, port 1, "IN ADD" (annotated as "C" in *Id.*, Fig. 11-Annotation 1, above). Another is labeled as 80b, port 3, "OUT DROP" (annotated as "D"). (*Id.*) In one example, first spectral channel λ_2 exits the OUT DROP port, and Bouevitch adds a new second channel on the same wavelength λ_2 at the IN ADD port. (*Id.*, 14:27-65.) Although both the added and the dropped channels use the same wavelength, they are separate channels. (Ex. 1028 at ¶ 51.) Bouevitch discloses the "in/out/add/drop ports" as part of its "configurable add/drop multiplexor". (*Id.*, 10:56-61, 1:11-15.)

Output Port: The second part of limitation 1[b] recites: "an output port for an output multi-wavelength optical signal." Bouevitch discloses an output "OUT EXPRESS" output port (annotated as "E," in Fig. 11-Annotation 1, above) wherein a multi-wavelength signal including one of the original input channels (wavelength λ_1) is combined with an added channel (λ_2), which together exit the output port 80a(3). "[T]he added optical signal corresponding to λ2 is combined with the express signal corresponding to λ1. The multiplexed signal…returns to port 2 of the first circulator 80a where it is circulated out of the device from port 3." (*Id.*, 15:14-18; Fig. 11.)

(4) Element 1[c] - wavelength-selective device

The next element, 1[c], requires "a wavelength-selective device for spatially separating said spectral channels." Diffraction grating 20 in Bouevitch Fig. 11 is such a device. Figure 11 shows that the grating spatially separates combined channels $\lambda_1\lambda_2$ ("A" at Fig. 11-Annotation 2, below) into separated channels ("B"):



Bouevitch states, "[t]he emerging beam of light λ_1 λ_2, is transmitted to an upper portion of the spherical reflector 10, is reflected, ***and is incident on the diffraction grating 20, where it is spatially dispersed into two sub-beams of light carrying wavelengths λ_1 and λ_2, respectively***." (Ex. 1003 at 14:48-53 (emphasis added); 8:10–22; *see also* Ex. 1028 at ¶ 53, ¶¶ 102-104.)

(5) Element 1[d] – 2-axis beam-deflecting elements

This final element of claim 1 has three subparts. Bouevitch teaches the first two, and Smith teaches the third. Each subpart is discussed in turn, below.

Beam-deflecting Elements: The first part of element 1[d] recites: "a spatial

array of beam-deflecting elements positioned such that each element receives a corresponding one of said spectral channels." Bouevitch discloses this element as MEMS mirror array 50 in Fig. 11-Annotation 2, above. Bouevitch positions its MEMS mirrors to receive and reflect the beams of light carrying the respective spectral channels dispersed by the diffraction grating. Bouevitch discloses "modifying and reflecting a beam of light spatially dispersed by the dispersive element" where, for COADM operations, the "modifying means is preferably a MEMS array 50." (Ex. 1003 at 3:42–45; 14:26-27.) Each mirror in the MEMS array (elements 51 and 52 for Fig. 11-Annotation 2, above) reflects a separate, corresponding beam of light (channels λ_1 & λ_2 respectively) such that the channel reflected by mirror 51 is passed though, and the channel reflected by 52 is dropped. (Ex. 1003 at 14:52-63, Fig. 11.)

Individually / Continuously Controllable: The second part of limitation 1[d] recites wherein each of the elements of the array is "individually and continuously controllable in two dimensions to reflect its corresponding spectral channel to a selected one of said ports." The BRI of controllable "in two dimensions" means controllable "in two axes." The BRI of "continuously controllable" is "under analog control."

First, Bouevitch discloses "individual" control of each mirror in MEMS array 50. "[E]ach sub-beam of light…is transmitted to separate reflectors 51 and